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874. *GEMMULOBORSONIA*, A NEW GENUS OF THE FAMILY TURRIDAE (GASTROPODA) FROM THE PLIO-PLEISTOCENE CABATUAN FORMATION, NORTHWEST LUZON*

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Abstract. *Gemmuloborsonia*, a new genus of the Borsoniinae, Turridae, Neogastropoda is proposed here on the type-species, *G. fierstinei,* sp. nov. from the Plio-Pleistocene Cabatuan Formation on Tambac and other islands in Tambac Bay, the Bolinao district, Northwest Luzon. *Gemmuloborsonia* shows superficial similarity to *Kuroshioturris* Shuto, 1961, of the Turrinae in the shell-profile, protoconch, sculpture and anal sinus, but is readily distinguished from the latter in being provided with a distinct columellar plait. The genus includes four species from the Upper Miocene and Plio-Pleistocene of the Mediterranean and Malayan regions.

Key words. *Gemmuloborsonia*, Turridae, Cabatuan Formation, Luzon, Philippines

Introduction

I had an opportunity to examine a large and interesting collection of molluscs collected by L. H. Fierstine and B. J. Welton by courtesy of E.C. Wilson, Los Angeles County Museum of Natural History. The collection consists of 75 species of bivalves, 13 species of scaphopods and 257 species of gastropods, of which 71 species (20.6 percent) belong to the family Turridae. Among the turrids I found a very characteristic species which shows a *Gemmula*-like profile, sculpture and anal sinus but has a paucispiral protoconch and a distinct borsonine columellar plait. I recognized a similar feature in *Pleurotoma coronifera* Martin, 1879, from the Upper Miocene of Java. They together with *Rouaultia lapugyensis* (Mayer, 1874), and *R. bicoronata* Bellardi, 1877, represent a particular group of the Borsoniinae. This group is separable from any known genera and I would propose here a new genus, *Gemmuloborsonia*.

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On the occasion of the description, I would express my cordial thanks to Dr. E. C. Wilson who made me access to the material and to Dr. L. H. Fierstine for his kind information on the stratigraphy of the Tambac area.

Description

Family Turridae Swainson, 1840
Subfamily Borsoniinae Bellardi, 1875
Genus *Gemmuloborsonia*, gen. nov.

Type-species : *Gemmuloborsonia fierstinei*, sp. nov.

Diagnosis : — Shell moderately small and fusiform with distinctly gemmulate peripheral cord. Anal sinus deep with subparallel upper and lower arms and its crest on peripheral cord. Columellar plait blunt and distinct. Protoconch paucispiral, globose and practically smooth.

Comparison : — The present taxon is superficially similar to *Kuroshioturris* Shuto,

1961, a subgenus of the genus *Gemmula* Weinkauff, 1875, in fusiform shell-profile, gemmulate peripheral cord, deep anal sinus and globose paucispiral protoconch. However, the present taxon is essentially different from *Kuroshioturris* by a blunt but distinct columellar plait and naturally included in the Borsoniinae. It must be a member of the group of *Micantapex* Iredale, 1936, and *Parabathytoma* Shuto, 1961, sharing a few important features — gemmulate peripheral cord on which is the crest of deep anal sinus, and globose paucispiral protoconch. Comparing with the latter two genera, *Gemmuloborsonia* is more fusiform with higher spire and more contracted and longer base. Furthermore, it is provided with deeper anal sinus and more distinct columellar plait than the latter.

Bellardi (1877, p. 223) proposed a genus, *Rouaultia*, for his Section 1 of *Borsonia* Bellardi, 1875, without designation of the type-species, emphasizing that a sharp carina at the middle of whorls and a plica on the columella are the most characteristic feature of *Rouaultia*. On that occasion he recorded three species. The first and second species, *R. subterebralis* (Bellardi in Sismonda 1842), and *R. lapugyensis* (Mayer, 1874), were included in his Section 1 of *Rouaultia* and the third species, *R. bicoronata* (Bellardi, 1875), comprised his Section 2. According to Bellardi (1875), contracted base is a distinctive feature of the Section 1 separating from the Section 2 with regularly tapering base. While *R. lapugyensis* and *R. bicoronata* seem to satisfy his definition, *R. subterebralis* suggests a question about its sistematic position because its columellar plait is obsolete and its coronated peripheral keel is somewhat upturned.

Cossmann (1896, p. 95) designated *Pleurotoma subterebralis* as the type-species of *Rouaultia*. He then regarded *Rouaultia* as a junior synonym of *Cochlespira* Conrad, 1875, and included them in the Borsoniinae. Grant and Gale (1931, p. 571) followed Cossmann (1896). Powell (1942, p. 20) once pointed out a significant difference of position of the anal sinus of *Cochlespira* and *Rouaultia*. That is to say, the anal sinus is situated on the shoulder in *Cochlespira* instead on the peripheral carina in *Rouaultia*. Later he (1966, p. 42) regarded them as synonyms by accepting the subsequent designation of the type of *Rouaultia* by Cossmann and recognizing essential identity between *R. subterebralis* Bellardi and *Cochlespira cristata* Conrad of the Turriculinae. I agree with this treatment. There by the systemetic position of *Rouaultia lapugyensis* and *R. bicoronata* is in suspense although they have distinctive characteristics. Proposal of *Gemmuloborsonia* for this group of species must dissolve the problem just mentioned.

Characteristic species and distribution : — *Gemmuloborsonia fierstinei*, sp. nov., Uppermost Pliocene to Lower Pleistocene, Northwest Luzon, the Philippines; *G. coronifera* (Martin), Upper Miocene of Java, Indonesia; *G. bicoronata* (Bellardi), Upper Miocene of North Italy and *G. lapugyensis* (Mayer), Upper Miocene of North Italy.

Gemmuloborsonia fierstinei, sp. nov.

Figures 1-1—3, 2-1—3

Material : — Holotype, No. 6449* from loc. 5905, almost perfectly preserved except for the anterior margin of the labrum. Paratype, No. 6450* from loc. 5911, almost perfect except for a part of the labrum and the extremity of the canal.

Other specimens, No. 6451* from loc. 5914, the first volution of the protoconch and anterior margin of the labrum broken off; and No. 6452* and No. 6453 from loc. 5918, protoconchs and canals are partly broken. Other two imperfect specimens respectively from loc. 5911 and 5918 are also examined.

All the specimens with asterisk were collected by L. H. Fierstine and B. J. Welton and are stored in Los Angeles County Museum of Natural History.

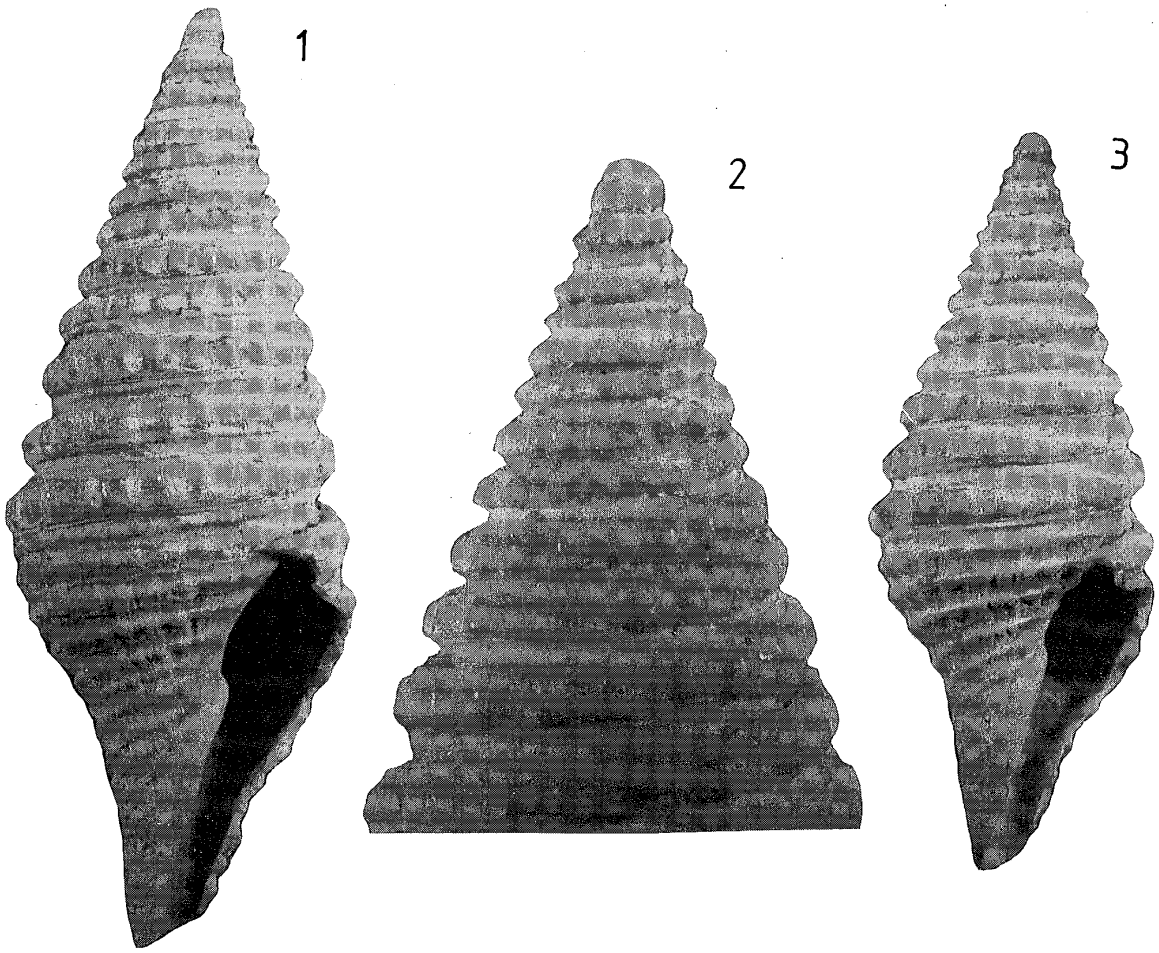

Figure 1. *Gemmuloborsonia fierstinei*, sp. nov. **1,** apertural view of the holotype, Reg. No. 6446 (Los Angeles County Museum, Nat. Hist.). H=13.4 mm ; **2,** apical part of Reg. No. 6453 ; **3,** aperturel view of the same specimen as the preceding figure. H=13.2 mm.

Measurements.—

Specimen No.	H (mm)	D (mm)	Bd (mm)	D/H (%)	Bd/H (%)
6449*	13.4	4.9	8.4	36.6	62.7
6450*	17.2+	6.1	10.3	35.5—	59.9—
6451*	13.4+	4.8	8.6	35.8—	64.2—
6452*	14.3+	5.6	8.8	39.1—	61.5—
6453*	13.2+	4.8	7.7	36.3—	58.3—

numb. (proto)	whorls (teleo.)	A (degrees)	numb. gemmules I	II	pen	bod
1.6	7.1	40.3	14	14	19	18
1+	7+	42.5	15	15	23	25
—	7.2	40.2	13	14	20	23
1+	7+	41.7	—	—	20	23
1.5	7.4	41.1	13	15	19	20

Diagnosis : — Shell rather small, fusiform with an apical angle of about 40 degrees. Protoconch paucispiral, globose and almost smooth except on last one-sixth volution provided with thin brephic axial threads. Teleoconch-whorls with coarsely gemmulate heavy two cords. Anal sinus deep with its apex on peripheral cord. Columellar lip with a distinct plait.

Description.— Shell is moderately small, less than 18 mm in height, shortly fusiform with high conical spire and moderately long and distinctly contracted base. Spire may be slightly conoidal. Apical angle is about 40 degrees. Protoconch is globose and paucispiral consisting of about one and a half smooth volutions and one-sixth brephic volution. The boundary between the protoconch

and teleoconch is clearly indicated by an opisthocyrtly curved ridge, which runs from suture to suture.

Teleoconch consists of about seven whorls in maturity. Whorls are low showing a height-width ratio of about 1/3, separated from each other by deeply incised suture, and heavily coronated by two prominent gemmulate cords. On the first whorl the prominent gemmulate peripheral rib appears together with a microgranulated subsutural thread, which is far weaker than the peripheral rib. The relative size of the peripheral rib, which is situated somewhat below the middle, is about two-fifths of the whorl-height. The subsutural thread abruptly becomes strong ; about one-half width of the peripheral one on the third whorl, about two-thirds on the fifth and almost equal to the peripheral one on the sixth. The subsutural rib is emarginated by one fine thread respectively along the upper and lower margins on the fourth and later whorls. The peripheral rib has a similar acompanying thread along its upper margin, which may appear on the third or fourth whorl. Another thread is developed close to the just mentioned thread on the narrow and deep sulcus between the two major ribs on the later whorls.

Body whorl is about three-fifths of the whorl-height. Its basal contraction is distinct. On the basal slope below the peripheral rib are four granulate lirae, of which the lowest one is weaker than the others. Eight other smooth lirae are discernible on the snout. A secondary thread may be developed in the interspace between the primary rib and lirae on the basal slope. Aperture is elongately rhomboid with a long, narrow and slightly oblique canal, the end of which is truncated. Parietal callus is discernible but not thick. Anal sinus is deep with its crest on the peripheral cord. Its upper and lower arms are subparallel near the crest and then divergingly curved.

Comparison : — The present species looks

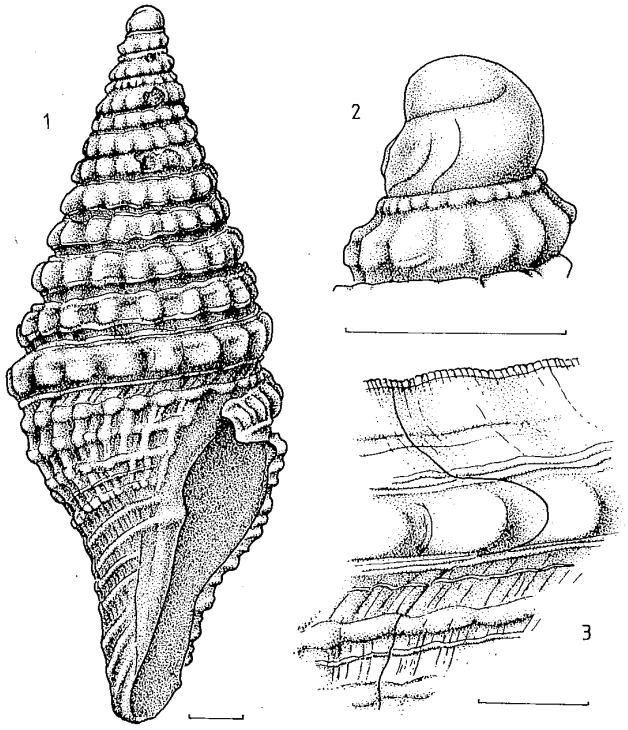

Figure 2. *Cemmuloborsonia fierstinei*, sp. nov. Holotype, Reg. No. 6449 (Los Angeles County Museum, Nat. Hist.) from loc. 5905, the Cabatuan Formation ; **1,** apertural view ; **2,** protoconch and the first whorl of teleoconch ; **3,** sculpture on the body whorl. Unit bars indicate 1 mm, respectively.

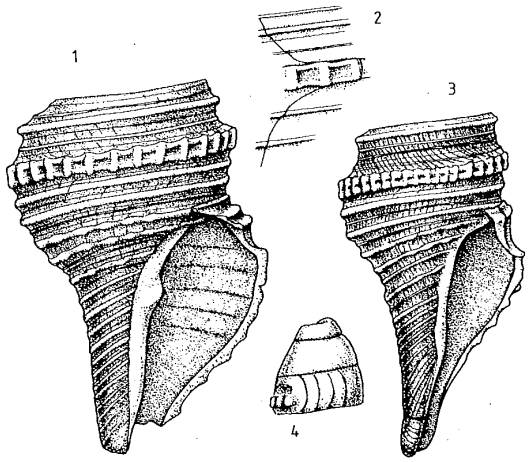

Figure 3. 1, 2, *Gemmuloborsonia coronifera* (Martin), Reg. No. St. 7876 (Nat. Mus. Geol. Min. Leiden) from loc. O of Junghuhn, West Java. Upper Miocene. **1,** body whorl, w=23.3 mm ; **2,** sculpture on the body whorl ; **3, 4,** *Gemmula (Gemmula) imitatrix* Martin, Reg No. St. 7851 (Nat. Mus. Geol. Min. Leiden) from Kemban Sokkoh, West Progomountain, Middle Java. Lower Miocene. **3,** body whorl, w=7.1 mm ; **4,** protoconch.

like a miniature of *Gemmula* (*Gemmula*) *congener congener* (Smith), but is readily distinguished from the latter in having a paucispiral globose protoconch and a distinct columellar plait.

The present species is easily separated from *Gemmuloborsonia coronifera* (Martin) from the Upper Miocene of Java, because the former is provided with equally prominent and gemmulate peripheral and subsutural ribs instead of gemmulate peripheral and smooth subsutural ones on the latter. It is also readily distinguished from *G. lapugyensis* (Mayer) and *G. bicoronata* (Bellardi) from the Upper Miocene of North Italy by the same reason as in the foregoing case.

Distribution : — Uppermost Pliocene to Lower Pleistocene of Northwest Luzon, the Philippines.

Gemmuloborsonia coronifera (Martin)

Figures 3-1—4

1879, *Pleurotoma coronifer* Martin, Tertiäerschichten auf Java, p. 61, Tab. 11, F. 2.
1916, *Rouaultia coronifera*, Martin, *Samml. Geol. Reichsmus. Leiden, N.F.*, Bd. 2, S. 229 (probably misprint of *Rouaultia*)
1964, *Gemmula* (*Gemmula*) *miocoronifera* Powell, *Indo-Pacific Moll.*, vol. 1, no. 5, p. 254, pl. 194, figs. 1 and 2.

Type-specimen : — Reg. No. St. 7876, Nat. Mus. Geol. Min. Leiden. The type-specimen, came from the Upper Miocene of loc. O of Junghuhn, west Java, is imperfect being devoid of apical part and the anterior portion of the canal.

Description : —The type-specimen is moderately small with measured height of 23.3 mm and diameter of 9.9 mm. It shows a quite similar feature to *Kuroshioturris* except for the columellar plait.

It has a prominent, gemmulate peripheral carina at the middle of each whorl. The carina is superimposed by two lirae respectively near the upper and lower margins. Sharp crenulations are vertically elongated to connect the two lirae of the carina. Infrasutural rib is at some distance from the suture on the later whorl. It is prominent and smooth and is accompanied by secondary threads on both upper and lower sides. Below periphery are five basal ribs, of which upper two are simply smooth and lower three are weakly granulate. More than twelve primary spirals are discernible on the snout. They are weaker on the more anterior part than those on the more posterior part. Secondary and, even, tertiary fine lines are intercalated in the interspaces of the primaries. Aperture is elongately rhomboid with a long canal. Anal sinus is very deep with its crest on the peripheral carina and parallel upper and lower arms. A distinct plait is discernible at the upper part of the columellar lip. Protoconch and early part of the teleoconch are not observed.

Remarks.— Four years after his proposition of *Pleurotoma coronifer*, Martin (1883, p. 58-59) emended the spelling of its specific name to *coronifera* and added some descriptive remarks. That is to say, he referred to the protoconch on the basis of a suitably preserved small specimen from the type locality and farther discussed a variability of sculpture on the result of examination of several specimens from Djokdjokarta, Tambak Batu, Grissee and Ngembak in Java. The figured specimen (1883, pl. 4, fig. 58) came from Djokdjokarta. Then in 1916, he recognized two forms among the specimens from the type locality. One form is represented by the figured type of *P. coronifer* (1879, pl. 11, fig. 2), which is characterized by weak columellar plait and is referred to *Rouaultia*. The other is devoid of a columellar plait and quite identical to the figured specimen in 1883 (loc. cit.). Martin proposed a new name, *Pleurotoma* (*Hemipleurotoma*) *imitatrix*, for the latter form. On that occasion, he illustrated a specimen (Reg. No. St. 7851, Nat. Mus. Geol. Min. Leiden) from the Lower Miocene Kemban Sokkoh of West Progo Mountain,

East Java (pl. 1, fig. 13) instead of specimens from loc. O. Although he did not designate the type specimen, the figured specimen in 1916 must be regarded as the type. *P. imitatrix* is reasonably referred to *Gemmula* on the basis of the characteristics of both protoconch and teteoconch of the type specimen.

Another specimen was described under the name of *Pleurotoma coronifera* by Boettger (1883, S. 156, Taf. 9, F. 7) on the basis of the specimen came from the Upper Miocene of Benkulen, Sumatra. It is, however, devoid of a columellar plait and quite identical to *Gemmula imitatrix* except for smaller shell with larger pleural angle.

Martin compared his *Pleurotoma coronifer* with *Rouaultia bicoronata* (Bellardi) in his original description. The former, however, is clearly distinguished from the bicoronated latter.

Later, Powell (1964, p. 254) stated that the name *Pleurotoma coronifer* Martin must be considered as a homonym of *Pleurotoma coronifera* Bellardi and proposed a new name, *Gemmula miocoronifera* for Martin's species. However, *P. coronifera* (=*coronifer*) actually belongs to *Gemmuloborsonia* as already mentioned and its specific name is valid.

Distribution: — Upper Miocene of Java, Indonesia.

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Gemmuloborsonia, 北西ルソンの鮮新—更新統の Calatuan 層産の Turridae 科(腹足類)の一新属: Bellardi (1877)は模式種の指定なしに *Rouaultia* を Borsoniinae 亜科の属として提案した。Cossmann (1896)は原著者の *Rouaultia* 3種のなかの筆頭種である *Pleurotoma subterebralis* Bellardi を後模式種に指定した。又 *Rouaultia* は *Cochlespira* Conrad, 1875, と本質的な差はないので後者の異名とし, Borsoniinae に含めた。Powell (1966)は属の扱いでは Cossmann を踏襲したが, 亜科としては Turriculinae に含めた。原記載の残りの種, *P. lapugyensis* Mayer と *P. coronata* Bellardi では後湾入(肛門湾入)は周縁肋上にあり, 軸唇

には明瞭な褶が1つあるので *P. subterebralis* とは明らかに異なる。所属が宙に浮くことになったこれら2種と共通の形質を具えた種がフィリピン・ソルン島北西部のタムバック湾の Cabatuay 層(上部鮮新—下部最新統)に多産する Turridae 科の中に発見された。これを *Gemmuloborsonia fierstinei* と命名し，それを模式種として新属 *Gemmuloborsonia* を提案する。インドネシヤ・ジャワ島産 *Pleurotoma coronifera* Martin も本種に含まれる。模式種を除く3種はすべて上部中新統産である。 首藤次男